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Notes on the Frog Genus *Diaglena* Cope

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The frog genus *Diaglena*, until very recently, has been represented in the herpetological collections of the world by a total of seven specimens. Three of these, in the British Museum (Natural History), are the cotypes of *Diaglena spatulata* (Gunther) , collected by Forrer at Presidio de Mazatlan, Sinaloa. There are two topotypes of *spatulata* in the University of Kansas Museum of Natural History, collected by Edward H. Taylor. The sixth specimen, in the United States National Museum, number 115500, was collected by Thomas MacDougall on the Cerro Arenal, Oaxaca, and is the holotype of *Diaglena reticulata* Taylor (1942, p. 60) . The American Museum of Natural History has the seventh specimen, which was collected by P. Ruthling and later designated a paratype of *reticulata*. During the summer of 1950, I was fortunate enough to be on the coast of Michoacan in the small town of Ostula when the first heavy rains of the season began to fall, and found there a small breeding congregation of frogs belonging to this rarely-encountered genus. A total of seven frogs was collected, enough to double the number previously available. A detailed list of the other reptiles and amphibians collected in this region by myself and others has appeared elsewhere (Peters, 1954) .

Specific Determination. The new specimens, although assigned to *Diaglena reticulata*, bear an equally strong resemblance to *D. spatulata* (Gunther) , and a strong case for their assignment there might be made. I have had available for comparison with my specimens the individual designated as a paratype of *D. reticulata*, AMNH 13840. Four specimens of *D. spatulata* were available to me, which were part of a series of six collected by William Riemer and Richard Zweifel near Mazatlan, Sinaloa, in the summer of 1953. While I received the specimens too late for complete documentation in this paper, I was able to clean a skull of one and found that it agrees in all particulars with that of *reticulata*, described below.

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The dorsal surface of the Michoacan specimens is comparatively smooth or only very slightly granular ; the ventral surface is very granular. However, this granulation is confined to the ventral surfaces, while in the paratype of *reticulata* it extends unbroken to the dorso-lateral region, where it loses its conspicuousness. The granulation on the venter is not continuous with that on the thighs in the Michoacan specimens, while the whole groin is granular in the paratype.

The canthal ridges unite slightly posteriorly to the nostril on all my specimens, but this appears to be equally true of the paratype of *reticulata*, which resembles the figure drawn in Taylor (loc. cit., p. 63, fig. 2) of *spatulata* rather than that of the holotype of *reticulata* (loc. cit., fig. 1) . None of the specimens I have seen have the ridge between the nostril and the eye either a straight line or slightly curved outwardly, as in the type of *reticulata*. Rather the ridges show a slight inward curve, as in *spatulata*. The distance that the ridge extends across the snout is variable within the specimens examined. AMNH 13840 has a slightly longer and more prominent ridge than the type of its species, and my specimens vary from a situation as in the paratype to a bold ridge extending to the tip of the snout, completely interrupting the rugosities and sculpturing of the lip flange.

The character of the proportion of the head width to head length does not seem to hold good when the entire series now available is measured. Taylor (loc. cit.) says that *reticulata* differs "in having the head proportionally shorter and broader," (not "head broader and longer proportionally," as stated in Smith and Taylor, 1948, p. 69) . Using all published measurements as well as those of the specimens I have examined, I find that the range of variation in the proportion head-width/head-length is 69.9-83.3 in *spatulata* from Sinaloa; 71.4-83.3 in *reticulata* from Oaxaca; and 70.4-80.3 in my specimens from Michoacan.

The post-tympanic region is quite thickened in all of my specimens, and the paratype shows a distinct post-tympanic ridge, which is apparently lacking in the type. The outer metatarsal tubercle is small and weak on four of my specimens, one individual lacks it entirely, and one has it well formed, though small, as is the case in the paratype. The tarsal fold is strong in the paratype, while it is slight in the Michoacan specimens. The webbing of both fingers and toes is practically identical in the paratype and the material from Michoacan.

The coloration of a living specimen was as follows (excerpted from my field notes, July 15, 1950) : "Head gray brown with chocolate brown markings or reticulations. Eye strongly projecting with a gray green skin on the back half, pupil black with a golden iris reticulated with black. Dorsal color dull green, with reticulations of black mid-

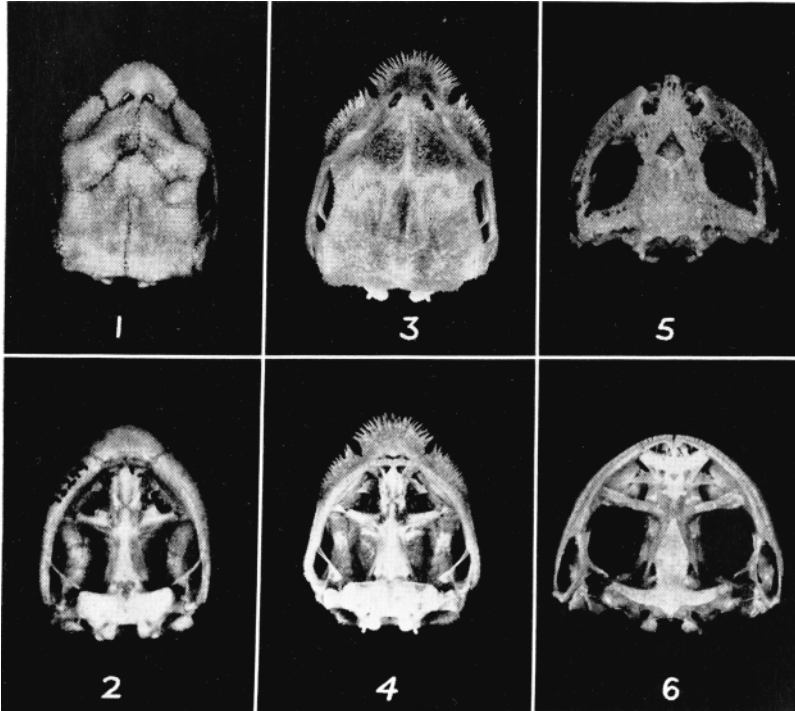


Plate 1. Dorsal and ventral views of the skulls of three calque-headed Hylid genera. Fig. 1-2, *Tripurion petasatus* (Cope), UMMZ S-167, El Petén, near La Libertad, Guatemala. Fig. 3-4, *Diaglena reticulata* Taylor, UMMZ 104418, Ostula, Michoacan. Fig. 5-6, *Pternohyla fodiens* Boulenger, UMMZ 72211, 5 miles north of Noria, Sonora. All are approximately life size.

dorsally, and of chocolate brown dorsolaterally and laterally. The dull green of the back lightens dorsolaterally and fades into the neutral color of the low sides. The upper surfaces of the arms and legs are the same color and pattern as the back. The first two fingers are solid cream, the other two are cream with chocolate reticulations. The hind foot is almost entirely chocolate above, with some greenish spotting. The lower part of the head flange is light, fairly iridescent green, with slight chocolate mottling. The chin and throat are white. The belly is greenish-cream, while the lower surfaces of the arms and legs are a flesh tint. There are no flash colors on the femur or in the groin." Several of my specimens are considerably more heavily mottled with brown above than is the paratype of *reticulata*.

From the above data, it would appear that my specimens most closely resemble *reticulata* in the least variable character used to separate the two species, that of coloration. The rest of the diagnostic characters of *reticulata* seem to be quite variable both within and between the species of the genus. The intermediacy of my specimens suggests that the two forms are related subspecifically. Such a change in status requires considerably more material than is now available, however.

Generic Position. The validity of the genus *Diaglena* Cope (1887, p. 12) has been questioned on several occasions since its description, which was based upon Gunther's description of *Triprion spatulata* (1882, p. 279). Boulenger (1891, p. 456) recognized *Diaglena*, but compared it with *Tetraprion* Stejneger and Test (1891, p. 167), and demonstrated that the presence of palatine teeth in *Tetraprion* was not a unique character, but was shared with *Diaglena*. The presence of teeth on the palatine bone in *spatulata* had not been determined previously, since Gunther described the species from living individuals. Boulenger thereupon synonymized *Tetraprion* with *Diaglena*. Gunther (1901, p. 293) did not accept the presence or absence of palatine teeth to be of generic value, and he placed both *Diaglena* and *Tetraprion* in the synonymy of *Triprion* Cope, a genus lacking palatine teeth. Miranda-Ribeiro (1920, p. 5) followed Boulenger in synonymizing *Diaglena* and *Tetraprion*, but he considered that generic unit to be distinct from *Triprion*. Myers (1942, p. 154) recognized all three genera as distinct, using, in addition to the palatine teeth, the *pattern* of the cranial ridges as a generic character. He pointed out that a deep, narrow notch was present in the tip of the flange in *Tetraprion*, while the tip is entire on *Diaglena* and *Triprion*. Myers also briefly discussed the relationship of these genera to *Corythomantis* Boulenger, *Aparasphenodon* Miranda-Ribeiro, and *Garbeana* Miranda-Ribeiro, all South American casque-headed genera. Due to the paucity of specimens, all of these earlier authors have been confined to examination of external

manifestations of skull characters.

I have removed the skull from one of my specimens for comparison with skulls of other closely related Mexican genera, and have thereby made available an additional character of value in the definition of the genus *Diaglana* (Plate 1) . In this genus the labial shelf is made up of bony spines, which are gathered in three fan shaped groups around the upper lip. The center of each of the lateral groups is at the central portion of the maxillary bone, while the group on the tip of the snout is formed by the fusion of units from the two premaxillary bones. In *Tripriion* the labial shelf is a solid bony flange, with a comparatively flat surface, both dorsally and ventrally. Several series of small denticulations give it a serrated edge. There is a deep notch in the flange of *Diaglana* at the suture between the maxillaries and premaxillaries, while in *Tripriion* the notch is missing and the suture extends to the rim of the flange. The fusion of the premaxillaries at the tip of the snout is complete, and, as pointed out above, no notch is present.

When the bony flanges of both genera are covered with skin, practically all of the underlying differences are obscured. The skin covers both the shelf of *Tripriion* and the spines of *Diaglana* in much the same fashion, although the "radiating grooves or short reticulated grooves" referred to by Taylor (1942, p. 59) as present on the dorsal part of the projecting flange of *Diaglana* correspond to the underlying bony spines, and are missing in *Tripriion*. When the tips of the spines protrude through the skin, as often happens at the tip of the rostrum and across the back of the head in *Diaglana*, they give the appearance of being rows of tiny tubercles. The ridge that runs across the back part of the skull is made up of vertical spines set very closely together, many of which project through the skin to make the ridge rugose. Judging from the figure of *Tetrapriion* in Stejneger and Test (1891, pl. 3, fig. 1), the labial flange is composed of a solid bony shelf, with many bony corrugations on the dorsal side, at least. The suture between the maxillary and premaxillary bones on both sides extends almost all the way out to the external border of the shelf, with only a small notch between them. On the other hand, there is a deep notch between the premaxillary bones.

These added characters, based upon the bony parts of the head, would seem to be strong substantiation of the generic distinctness of all three genera. The bony elements composing the flange are quite different in actual structure in each case, although their external manifestations are extremely similar in appearance. If my interpretation of Stejneger and Test's figure is correct, this character is an additional support for Myer's argument for a closer relationship between *Tripriion* and *Tetrapriion* than between *Diaglana* and *Tetrapriion*, for *Diaglana*

is alone in the formation of the bony shelf from groups of spines. I would be further inclined to hypothecate that a situation similar to that in *Diaglena* is ancestral to that of either *Tripriion* or *Tetrapriion*. It seems likely that spines preceded the solid bony flange, and that the latter resulted from a filling in of the interspine spaces. This is partially predicated upon the presence of small denticulations on the flange in *Tripriion*, which are presumably the surviving remnants of the original spines.

Gunther (1901, p. 292) suggests that *Pternohyla* Boulenger is "intermediate between the rough-headed *Hylae* and *Tripriion*." Myers (1942, p. 154) includes *Pternohyla* in his discussion, but its affinity with the *Tripriion-Corythomantis* series is questioned. *Pternohyla* has been considered a member of the group primarily on the basis of the presence of a slight flange on its lip. The co-ossification of skin with skull present in *Tripriion* and *Diaglena* is incomplete in *Pternohyla*. Although the genera appear alike superficially, the skulls are quite distinct (Plate 1), with *Pternohyla* differing from both the other genera in general proportions, amount of dorsal roofing, shape of parasphenoid bone, and other obvious characters. The slight flange present in *Pternohyla* is quite aspinose, although it is heavily sculptured.

The fourth Mexican genus possessing some degree of co-ossification of the skin with the skull is *Anotheca* Smith. The skull, as figured by Taylor and Smith (1945, p. 568), bears certain vague similarities to *Diaglena*, since both have spinose borders, but the spines in *Anotheca* appear to be part of the dorsal roofing bones of the skull, while *Diaglena* has the most prominent spiny region on the maxillary and premaxillary bones. The row of spines across the back of the skull is much more prominent and the individual spines more elongate than in *Diaglena*. There is little to indicate any degree of close relationship in these two casque-headed hylids.

It is still impossible to say anything further concerning the relationships of these forms with the other genera that Miranda-Ribeiro considered to make up the *Tripriioninae*. Certainly the appearance of *Aparasphenodon* in Miranda-Ribeiro's plate (1920, opp. p. 6) is strongly reminiscent of *Diaglena*, and it will be of utmost interest when the structure of its skull can become known.

Habits and Habitat. The locality mentioned above as the collecting site for these specimens (Ostula) is about 22 miles southeast of the mouth of the Rio Coahuayana, which separates the two states of Colima and Michoacan, and about 12 miles due north of Point San Telmo, on the shore of the Pacific Ocean. It is on the Rio Ostula, at an altitude of about 400 feet. We reached the town on July 13, 1950. The first heavy rain of the year started on the afternoon of July 14,

stopped during the late evening, and then began again in torrential fashion that night. The ditches were rapidly flooded, and the streets and fields of the town were soon all under water to a depth of several inches. just at nightfall *Diaglena* began calling, and the chorus continued until the rain stopped at about 1:00 A.M. Their call can be best compared to a low snore, rising in pitch. It is repeated at five to ten second intervals. The vocal sac is single.

Although no frogs had been seen in the town before the rain, when the chorusing began both this and other species were taken hopping up and down the streets and even into some of the less tightly closed houses. The choruses formed in fields that had been absolutely dry the day before, with the frogs sitting on the ground, usually under leaf cover from low plants. They showed no wariness at all and were easily taken. The eggs are deposited in these temporary pools, directly on the ground. The field party did not remain in Ostula long enough to permit collection of an ontogenetic series.

In living specimens the nostrils are directed up and backwards and are almost constantly in motion. The anterior edge of the skin flap pulls flat against the posterior margin of the bony rim of the nostril, and can close the opening completely. The thumb is as completely opposable to the other fingers as is that of *Agalychnis*. One individual grasped the barrel of a hypodermic needle with the thumb opposed and held it firmly.

Hyla baudini baudini (Duméril and Bibron) was found in full chorus with *Diaglena* in the same pools in the town. A short distance from the town, froth nests belonging to the species *Leptodactylus melanonotus* (Hallowell) were found on the river's edge, indicating that they had actively bred at the same time. *Hyla smithi* Boulenger was found breeding in a quiet pool of a tiny mountain stream on the morning of July 15, and presumably started their activity on the fourteenth also.

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